Pancreatic β-cells' functional "exhaustion" at Type 1 Diabetes onset may lead to early microvascular complications

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OBJECTIVES

Diabetic ketoacidosis (DKA) is the most severe acute complication and often the initial clinical manifestation of type 1 Diabetes (T1D). Diabetic nephropathy is one of the most devastating chronic complications of T1D and its early diagnosis is traditionally based on microalbuminuria. The aim of the study was to investigate the possible associations between the initial clinical manifestations and the chronic complications of T1D.

METHODS

This is an epidemiological retrospective study of data acquisition on clinical manifestations during the long-term follow-up of the children with T1D from the archives of the Diabetes Centre, First Department of Pediatrics, University of Athens, ''Aghia Sophia'' Children's Hospital from 1990 to 2013. We studied 567 individuals (51% males and 49% females) with T1D and mean age of diagnosis 8.24 years (95% CI for the arithmetic mean 7.91 to 8.57). Fifty-seven percent of these patients presented with DKA at diagnosis. The 24-hour urinary albumin excretion (UAE) [(nephelometer Turbox) Orion, Finland], was assessed in 196 of the 567 patients and microalbuminuria(MA) was defined with values between 30–300 mg/24 hours, measured on at least two of three measurements over a two- to three-month period). Statistical analyses were performed using MedCalc for Windows, version 12.5.

RESULTS

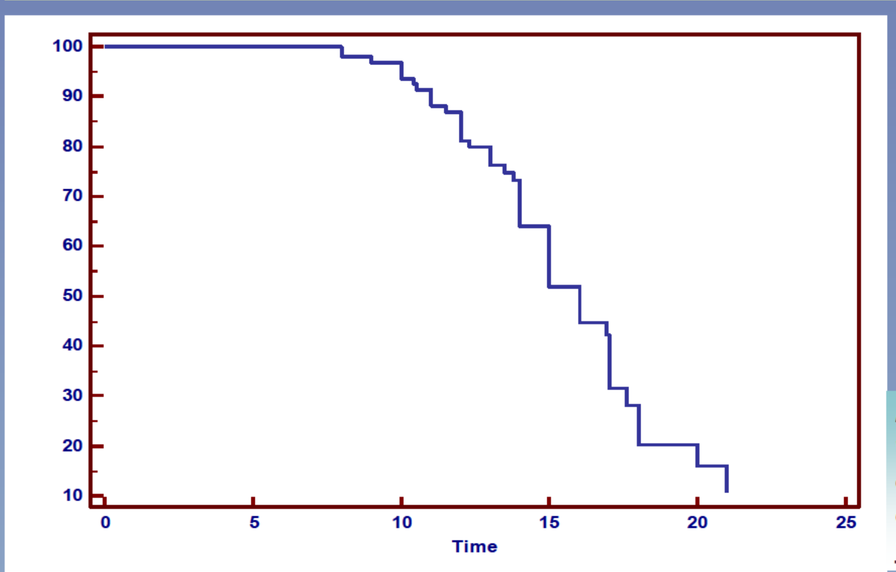

Figure 1: Survival analysis with Kaplan-Meier survival curve showed a mean age of microalbuminuria 15.7 years.

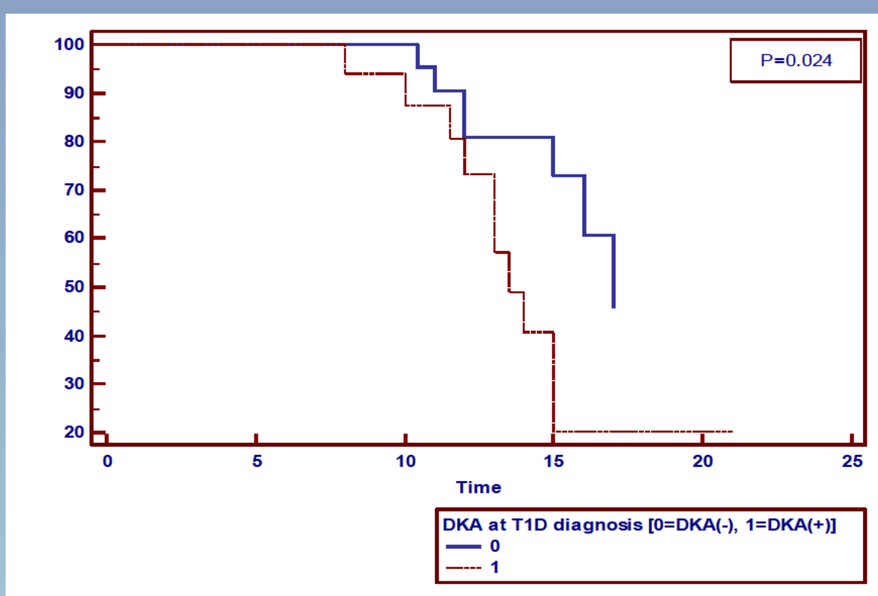

Figure 2: Kaplan-Meier survival curve showed a mean age of microalbuminuria 13.6 years for those patients who presented DKA at T1D onset, while the mean age for MA for those who had no DKA at onset was 17.4 years (p=0.024).

Sixty patients (30.6%) from a total number of 196 who were examined for urinary albumin excretion, were found to perform persistent microalbuminuria (MA was found on at least two of three measurements over a two- to three-month period). The mean value of HbA1c at the time of UAE measurement was 7.88 (95% CI for the arithmetic mean: 7.66 to 8.09) and no statistically significant difference was found between those who presented DKA at diabetes onset and those who did not. The mean duration of T1D was 4.9 years (95% CI for the arithmetic mean: 4.22 to 5.59). Survival analysis with Kaplan-Meier survival curve showed a mean age of microalbuminuria 15.7 years with no statistically significant difference between the two genders (Figure 1). Kaplan-Meier survival curve showed a mean age of microalbuminuria 13.6 years for the patients who presented DKA at onset of T1D, while the mean age for MA for those who had no DKA as the initial presentation was 17.4 years (p=0.024)(Figure 2). Regression analysis showed that the age of MA occurrence correlated with the duration of T1D (p<0.0001). No statistically significant correlation was depicted between the age of MA and HbA1c.

CONCLUSIONS

The mean age of microalbuminuria was significantly younger for the patients who had initially presented DKA and this finding may reflect a genetic or environmental predisposition regarding the severity of the course of T1D. It has been supported that decreased C-peptide levels are associated with microvascular complications in T1D[1,2,3]. Apparently, the pancreatic cells' disability to secrete adequate C-peptide and insulin levels early in the course of T1D, results not only in DKA but may trigger the initiation of the pathophysiologic phenomena that lead to the microvascular complications at a younger age.

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